UTS 4040

The SPERRY UTS 4040 is a microprocessor-based cluster controller designed for real-time, on-line interactive processing and local processing. Inasmuch as it allows user program and peripheral device sharing, systems with optimal cost performance can be configured to satisfy a wide range of application requirements. The basic components and expansion features of the UTS 4040 are:

- Processor
- One megabyte integral diskette load device (ILD)
- Power supply
- RS232C/V.24 communications interface
- 256 kilobytes of RAM memory minimum
- Up to eight 256K-byte RAM memory modules
- Workstation interface to attach up to six UTS 20W or UTS 40W display stations (maximum of 31 in UNISCOPE mode; 32 in DDP-4000 mode)
- Up to seven additional workstation interfaces
- Up to six of the following peripheral interfaces:
  - 8-bit peripheral interface
  - Dual 8-bit peripheral interface (providing two 8-bit peripheral interfaces)

The SPERRY UTS 4040 is intended for sophisticated distributed data processing consisting of functions such as:

- Interactive data entry under local program control
- Maintenance of local diskette files
- Report generation
- Data batching prior to host transmission
- Local COBOL processing
- Host queries
- Distributed Data Processing

When not under program control, each CRT workstation retains all the properties of an interactive data terminal on-line to Sperry hosts. Some of the UTS 4040 hardware features which contribute to its role as a distributed processing system are:

- Attachment of up to 31 or 32 CRT workstations and 48 peripheral devices
- Maximum 2M bytes of read/write memory (RAM)
- Data storage on double-sided, double-density diskettes with one megabyte capacity which is doubled when an expansion drive is configured
- Choice of five printers for wide range of requirements
- Data transmission speeds up to 19.2K bps
- Data storage on 8" disk with a capacity of 24 megabytes

SPERRY

Software support of distributed processing includes:

- Two system control programs:
  - —UNISCOPE mode System Control Software
  - —DDP-4000 System Control Software
- UTS COBOL (subset of ANSI) X3.23—1974)
- UTS BASIC
- Edit Processor
- Loadable Character Set Generator
- Text Processing Utility

Memory

The main memory of the UTS 4040 cluster controller consists of random access memory modules, each one having a capacity of 256K bytes. Each byte-addressable 22-bit word consists of 16 data bits and 6 error correction code bits. Data transfer between the peripherals and the main memory of the UTS 4040 are accomplished under control of dedicated microprocessors.

The 16-bit machine architecture of the UTS 4040 allows up to 128 K bytes of data to be directly addressed; however, the memory mapping techniques employed allow a much greater addressing range. Up to 2M bytes of memory may be configured in the UTS 4040.

The memory mapping aspect of the cluster controller goes beyond the ability to use large memories; it also provides the capability to limit the memory which can be addressed by a given program. This addressing "window" can be as small as 2K bytes of RAM or up to sizes as large as 128 K bytes and is adjusted in 2K byte "page" increments.

I/O Line Modules

All data coming into or going out of the UTS 4040 central memory is routed through one of several different kinds of input/output (I/O) controllers, otherwise known as line modules. All line modules, or device controllers they support, are used to buffer data which is either being sent or received. The line modules used in the UTS 4040 each contain their own dedicated microprocesssor and each runs a specialized program to handle the needs of that particular I/O function. The programs which drive the line modules are loaded from the integral diskette load device into distinct random access memories for each line module every time the system is turned on. Thereafter, each time a given line module is activated to perform its particular function, there is no need for the cluster controller central processor to do that function itself.

The application of random access memory on the line modules instead of read-only memory (which does not need to be loaded each time) means that the programs which make the line modules functional can be easily updated. This is done merely by using a different system diskette during the power-up phase of the UTS 4040 cluster. Great flexibility is inherent in this design.

State Machine Architecture

The UTS 4040 uses a 16-bit central microprocessor which provides thirty-two 16-bit registers for each of 48 different processor "states". Although only one state of the processor may be used at any one time, each state may be given a "time slice" to execute a variable amount of software code.

Because each state uses its own set of registers for control, different programs (executing in different states) are totally separated from one another; hence, a simple yet highly efficient security system results. Since each state is assigned its own block of memory and has memory visibility limitations placed on it, no given state of the processor can interfere with any other state. States may be allocated to the user programs, the I/O line modules or the system.

Data Security

It is the "state" aspect of the UTS 4040 software architecture that provides security by isolating one user program from another as well as from the system software of the cluster controller. The UTS 4040 performs "out of bounds" checks on memory accesses and classifies critical instruction as "privileged"—meaning that they cannot be executed by user programs. This factor is fundamental in preventing user programs from interfering with the overall operation of the sytem. Separate program states are also defined for the supervisor and I/O segments of the System Control software to isolate user programs, not only from each other but from these activities as well.

Keylocks are standard on the UTS 4040 cluster controller as well as on the UTS 20W and UTS 40W workstations to prevent unauthorized access to sensitive information (and to devices such as the integral load diskette). One workstation is used as the "master" workstation for the system. It is through the master workstation that the soft parameters of the system are entered.

System Software

A major component of the UTS 4000 system software is the System Control Software. This sophisticated software module acts as the "system manager" by directing the operation of the system, including concurrent multiple user applications, and managing all of the system resources—both hardware and software.

The UNISCOPE mode System Control Software provides compatibility for UTS 400 COBOL users to migrate to the UTS 4040 without requiring program modifications while, at the same time, retaining their full current UTS 400 functionality. This functionality includes interactive communications as well as local peripherals and UTS COBOL programs; however, changes to host software or user programs may be required to take advantage

of the added functionality offered on the UTS 4040. When operating in this mode, the UTS 4040 is compatible with the UNISCOPE 100 and 200 terminals as well as the UTS 400.

The DDP-4000 SCS operates in conjunction with DCP/Telcon and CMS 1100 to provide a terminal system that implements the Sperry Distributed Communications Architecture (DCA). Facilities are provided for Distributed Data Processing (DDP) that pair with DDP 1100 to form a powerful heterogeneous DDP network. Local programming and application software capability are also available.

UTS COBOL is the major language supported on the UTS 4000 system. The compiler offered conforms to the American National Standard X3.23-1974 with the following levels of support provided:

Module	Level
Nucleus	1 (with level 2 extensions)
Relative I/O	1
Sequential I/O	1
Segmentation	1
Inter-program Comm	1
Library	1
Table Handling	1
Debug (partial)	1

UTS 4000 Program Products

The Edit Processor allows the programmer to create and update source code files on diskette from where they may be retrieved as desired for compilation. The source code in question may be destined for execution on UTS 4000 systems or on a Sperry host. In both cases, program development proceeds offline from the host, and the programmer enjoys the more rapid response times which the intelligent terminal system provides. Reduced line costs are achieved because data must be sent to the host only at the time when a host compilation is to be performed.

The Text Processing Utility (TPU) is an application program that operates on the UTS 4040 with UTS 40 Ws and provides a general-purpose text processing capability. The TPU allows users to create, modify, format and print textual material that can be transmitted to a host processor. Other features of the TPU include document storage on diskette, document selection and retrieval, and a broad range of document maintenance procedures.

UTS BASIC is provided for the user who wishes to generate programs on the UTS 4000 cluster controller in a stand-alone mode. It conforms to the American National Standard for minimal BASIC (ANSI X3.60-1978) and has extensions for file input/output, program manipulation, program control, additional arithmetic and string functions, and UTS terminal oriented functions.

The File Transfer Utility allows the user to transfer symbolic (text) files between diskette storage on the cluster controller and mass storage on a Sperry host system—Series 1100, 90/60, 90/30, or System 80. Text may be transferred up-line to a host or down-line from a host. It also controls the printing of text from a diskette or host file.

The File Transfer Utility operates in conjunction with a host—resident editor.

The Loadable Character Set Generator (LCSG) is a utility program that provides the means of generating user-defined character sets; it provides the user with the capability of interactively creating, modifying and copying loadable character set definitions.

The LCSG can operate on the Series 1100, Series 9000 (VS/9 and OS/3) and the Series 80 host systems. Generated on a host system, resultant character sets, properly formulated, can then be down-line loaded to the UTS 40W display station.

ARM (Availability, Reliability and Maintainability)

Expanded Availability, Reliability and Maintainability (ARM) capabilities are provided on the SPERRY UTS 4040 as a result of its distributed microprocessor architecture and the availability of an extensive Power-on-Confidence test loaded from the diskette. In addition, a user diagnostic diskette is provided.

For more information on the SPERRY UTS 4040 cluster controller, contact your local Sperry sales office.

SPERRY UTS 4040

PHYSICAL CHARACTERISTICS

Width:	19 inches	(48.3 cm)
Height:	30 inches	(76.0 cm)
Depth:	31 inches	(78.7 cm)
Weight:	190 pounds	(86 kg)

POWER REQUIREMENTS

Nominal voltage
100, 120, 220 or 240 volts

Nominal frequency
50 or 60 Hz

Phases and lines
Single phase, 3 wire

Input power required
700 Volt-Amperes

Power Dissipation
252 Watts (1890 kJ/hr)

PERIPHERAL DEVICES

Software support of distributed processing includes:

- Two system control programs:
  - —UNISCOPE mode System Control Software
  - —DDP-4000 System Control Software
- UTS COBOL (subset of ANSI) X3.23—1974)
- UTS BASIC
- Edit Processor
- Loadable Character Set Generator
- Text Processing Utility

Memory

The main memory of the UTS 4040 cluster controller consists of random access memory modules, each one having a capacity of 256K bytes. Each byte-addressable 22-bit word consists of 16 data bits and 6 error correction code bits. Data transfer between the peripherals and the main memory of the UTS 4040 are accomplished under control of dedicated microprocessors.

The 16-bit machine architecture of the UTS 4040 allows up to 128K bytes of data to be directly addressed; however, the memory mapping techniques employed allow a much greater addressing range. Up to 2M bytes of memory may be configured in the UTS 4040.

The memory mapping aspect of the cluster controller goes beyond the ability to use large memories; it also provides the capability to limit the memory which can be addressed by a given program. This addressing "window" can be as small as 2K bytes of RAM or up to sizes as large as 128K bytes and is adjusted in 2K byte "page" increments.

I/O Line Modules

All data coming into or going out of the UTS 4040 central memory is routed through one of several different kinds of input/output (I/O) controllers, otherwise known as line modules. All line modules, or device controllers they support, are used to buffer data which is either being sent or received. The line modules used in the UTS 4040 each contain their own dedicated microprocesssor and each runs a specialized program to handle the needs of that particular I/O function. The programs which drive the line modules are loaded from the integral diskette load device into distinct random access memories for each line module every time the system is turned on. Thereafter, each time a given line module is activated to perform its particular function, there is no need for the cluster controller central processor to do that function itself.

The application of random access memory on the line modules instead of read-only memory (which does not need to be loaded each time) means that the programs which make the line modules functional can be easily updated. This is done merely by using a different system diskette during the power-up phase of the UTS 4040 cluster. Great flexibility is inherent in this design.

State Machine Architecture

The UTS 4040 uses a 16-bit central microprocessor which provides thirty-two 16-bit registers for each of 48 different processor "states". Although only one state of the processor may be used at any one time, each state may be given a "time slice" to execute a variable amount of software code.

Because each state uses its own set of registers for control, different programs (executing in different states) are totally separated from one another; hence, a simple yet highly efficient security system results. Since each state is assigned its own block of memory and has memory visibility limitations placed on it, no given state of the processor can interfere with any other state. States may be allocated to the user programs, the I/O line modules or the system.

Data Security

It is the "state" aspect of the UTS 4040 software architecture that provides security by isolating one user program from another as well as from the system software of the cluster controller. The UTS 4040 performs "out of bounds" checks on memory accesses and classifies critical instruction as "privileged"—meaning that they cannot be executed by user programs. This factor is fundamental in preventing user programs from interfering with the overall operation of the sytem. Separate program states are also defined for the supervisor and I/O segments of the System Control software to isolate user programs, not only from each other but from these activities as well.

Keylocks are standard on the UTS 4040 cluster controller as well as on the UTS 20W and UTS 40W workstations to prevent unauthorized access to sensitive information (and to devices such as the integral load diskette). One workstation is used as the "master" workstation for the system. It is through the master workstation that the soft parameters of the system are entered.

System Software

A major component of the UTS 4000 system software is the System Control Software. This sophisticated software module acts as the "system manager" by directing the operation of the system, including concurrent multiple user applications, and managing all of the system resources—both hardware and software.

The UNISCOPE mode System Control Software provides compatibility for UTS 400 COBOL users to migrate to the UTS 4040 without requiring program modifications while, at the same time, retaining their full current UTS 400 functionality. This functionality includes interactive communications as well as local peripherals and UTS COBOL programs; however, changes to host software or user programs may be required to take advantage

We understand how important it is to listen.

S7075R2

8304 Printed in U.S.A.